Unraveling the Mystery: Measuring Digestibility of Different Types of Baling Twine

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Introduction
When feeding hay bales to livestock, most ranchers remove the twine from the bale; however, some of the twine can be left on and potentially consumed by livestock. The concern is that the twine can affect the health of the animal when ingested. Consequently, the purpose of this experiment is to measure the digestibility of polypropylene, sisal, and sun-biodegradable (Clearfield™) baling twines in the rumen of beef cattle. The hypothesis is that (1) sisal twine will be significantly more digestible than the other twines; (2) sun-biodegradable twine will be the second most digestible; and (3) polypropylene twines will be the least digestible. This project is important because many ranchers feed cattle baled hay during late fall, winter, and early spring, and the cattle may accumulate baling twine in their rumen, affecting overall rumen volume and potentially reducing the amount of feed that an animal can consume and digest. Understanding the digestibility characteristics of different types of twine may help ranchers make more informed management and purchasing decisions when managing their own livestock.

Objectives
Because ingesting baling twine could be potentially hazardous for cattle, the study measures the ruminal digestibility of different types of baling twine.

Materials and Methods
This study was conducted at the James C. Hageman Sustainable Agriculture Research and Extension Center (SAREC) near Lingle. The standard protocol for measuring in vitro dry matter disappearance (IVDMD) was followed, utilizing the SAREC forage analysis laboratory and an existing ruminally cannulated cow (a cow that had previously been fitted with a porthole-like device allowing researchers access to the rumen). Samples of thick polypropylene, thin polypropylene, sisal, and Clearfield sun-biodegradable twines were cut into half-inch lengths, dried, and evaluated for IVDMD along with an alfalfa hay standard. Twine and alfalfa samples were placed in mesh bags and incubated in rumen fluid for 0, 12, 24, and 48 hours to determine the rate of disappearance (digestibility) during incubation.

Results and Discussion
After 48 hours incubation, the sisal baling twine was the most digestible with 15.82% disappearance. Both polypropylene twine samples as well as Clearfield all had minimal disappearance of only 0.27 to 1.55% (Table 1, Figure 1). While minimal digestion of polypropylene twine was expected, the Clearfield results were surprising because it naturally decomposes in sunlight, but remained indigestible in the incubation study. Final disappearance of the alfalfa hay standard resulted in the correct 58% disappearance (Table 1, Figure 1), confirming that the IVDMD procedure was conducted correctly.

Sisal twine is a natural fiber and is partially digestible in the rumen, but is more expensive than polypropylene twines. Poly twines are stronger, cheaper, and stay intact during storage, making transportation and feeding easier. Producers need to be aware of the potential feeding hazards of polypropylene and Clearfield twine if ingested by livestock.

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Table 1. Ruminal disappearance values, bale twine study.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Hours of Rumen Incubation</th>
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<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Alfalfa Hay</td>
<td>43.55&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Sisal</td>
<td>9.50&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Thin Polypropylene</td>
<td>1.26&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Clearfield</td>
<td>0.47&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Thick Polypropylene</td>
<td>0.47&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a,b,c</sup>Columns with different superscripts differ (P<.05)

Figure 1. Ruminal disappearance (digestibility) of various types of bale twine.